

Science Focus 8

Mechanical Systems

Pop Quiz Master

(5 questions) for each Topic

Answer Key

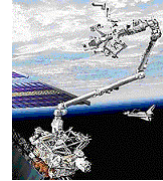
Science Focus 8 Topics	Questions					
	1.	2.	3.	4.	5.	6.
Topic 1 - Levers & Inclined Planes	B	C	C	C	C	D
Topic 2 - Wheel & Axle, Gears & Pulleys	B	B	C	B	D	
Topic 3 - Energy, Friction & Efficiency	C	B	C	C	B	
Topic 4 - Force, Area & Pressure	C	C	D	A	B	
Topic 5 - Hydraulics & Pneumatics	D	B	D	B	A	
Topic 6 - Combining Systems	A	D	C	B	C	
Topic 7 - Machines Through History	D	A	D	B	A	
Topic 8 - People & Machines	C	B	C	D	C	

Mechanical Systems

Topic 1 - Levers and Inclined Planes - Practice Quiz

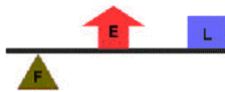
1. A wheelbarrow is an example of what simple machine?
 - A. Class 1 lever
 - B. Class 2 lever**
 - C. Winch
 - D. Inclined Plane

2. The Canadarm is an example of what simple machine?



- A. Class 1 lever
- B. Class 2 lever**
- C. Class 3 lever
- D. Class 4 lever

(Use the following diagram for the next question)



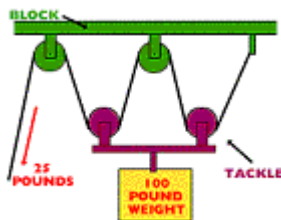
3. In the lever above, the Effort Force is applied at E. This makes it a ...
 - A. Class 1 lever
 - B. Class 2 lever**
 - C. Class 3 lever
 - D. Class 4 lever
4. Calculate the mechanical advantage, when 736 N of force is used on a bicycle pedal, causing 81 N of force to move the bicycle forward.
 - A. 917**
 - B. 655
 - C. 9.08
 - D. 0.11
5. A simple machine that converts rotational motion to linear motion is called ...
 - A. Inclined plane**
 - B. Wedge
 - C. Screw
 - D. Class 2 lever
6. The science of designing machines to suit people is called ergonomics. The primary criteria used in designing a machine ergonomically is ...
 - A. size**
 - B. aesthetics
 - C. expense
 - D. comfort

Mechanical Systems

Topic 2 - Wheel and Axle Practice Quiz

1. A device that consists of a small cylinder, with a handle or a crank, is called a ...
 - A. radius
 - B. winch
 - C. fulcrum
 - D. pinion
2. Gears are used in combination, with the teeth of the gears interlocking, so when one moves the other moves as well. Effort can be applied to the first gear (24 teeth), with the resulting effect on the second gear (12 teeth) being a ...
 - A. speed advantage of 0.5
 - B. speed advantage of 2
 - C. force advantage of 2
 - D. force advantage of 0.5
3. When gears are used in a gear train, the resulting effect is that each gear travels ...
 - A. slower than the one next to it
 - B. faster than the one next to it
 - C. in an opposite direction than the one it is nearest to
 - D. always in the same direction as the one next to it

4. The mechanical advantage of the block and tackle (complex combination of fixed and moveable pulleys) pictured here is ...



- A. 3
 - B. 4
 - C. 5
 - D. 6
5. The pedals on a bicycle are attached to sprocket gears which are linked together by a chain. The type of energy that describes the motion created when you apply force to the pedal is ...
 - A. gravitational
 - B. frictional
 - C. potential
 - D. kinetic

Mechanical Systems

Topic 3 - Energy, Friction, and Efficiency Practice Quiz

1. (**Efficiency = work output / work input**) A pulley system lifts a 100N load with a force of 20N. The input distance is 3m and the output distance is 0.5m. The efficiency of this pulley system is ...
 - A. 62.5%
 - B. 75.0%
 - C. 83.3%
 - D. 92.75%
2. Efficiency can be increased by reducing frictional force. A sport that tries to reduce frictional force by sweeping the ice in front of the rock is ...
 - A. cycling
 - B. curling
 - C. rock climbing
 - D. ice sculpturing
3. When a skater moves across an ice surface, a thin layer of water is created, allowing the skate blade to slide across the surface with little friction. This layer of water is produced by the pressure of the
 - A. zamboni
 - B. atmospheric pressure
 - C. skate blade
 - D. ice temperature
4. The process which transfers energy or power from one place to another is 'energy ...'
 - A. conversion
 - B. transformation
 - C. transmission
 - D. convection
5. Gymnasts rub chalk powder (called rosin) on their hands just prior to competing. They do this to ...
 - A. decrease friction
 - B. increase friction
 - C. increase efficiency
 - D. decrease efficiency

Mechanical Systems

Topic 4 - Force, Pressure, and Area Practice Quiz

1. To calculate pressure the formula used is $P = F / A$. Units of pressure are ...
 - A. joules
 - B. kilojoules
 - C. pascals
 - D. kilograms

2. The heel of a stiletto shoe can exert a lot of pressure. If the area of the heel is 0.5cm^2 and a force of 200N is exerted using the heel, what is the pressure exerted by the heel?
 - A. 10 Pa
 - B. 200 Pa
 - C. 400 Pa
 - D. 1000 Pa

3. Crash test dummies are used to test safety in vehicles. The main reason for this is because they are
 - A. inexpensive to use
 - B. realistic
 - C. easily repaired
 - D. non-living

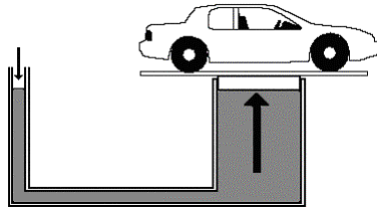
4. Pascal's law states that ...
 - A. pressure exerted on a contained fluid is transmitted equally in all directions
 - B. pneumatics exerted on a contained fluid is transmitted equally in all directions
 - C. force exerted on a contained fluid is transmitted equally in all directions
 - D. hydraulics exerted on a contained fluid is transmitted equally in all directions

5. A cherry picker uses hydraulics to raise a working platform. 10N of force are applied to the small piston in the hydraulic system to raise a load of 50N (on the large piston) a distance of 0.5m . How far would the small piston have to be pushed to accomplish this task?
 - A. 5 m
 - B. 2.5 m
 - C. 0.5 m
 - D. 25 m

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Topic 5 - Hydraulics and Pneumatics Practice Quiz

1. In the illustration below, the area of the small piston on the left is 0.5m^2 and the area of the large piston is 5.5m^2 ,



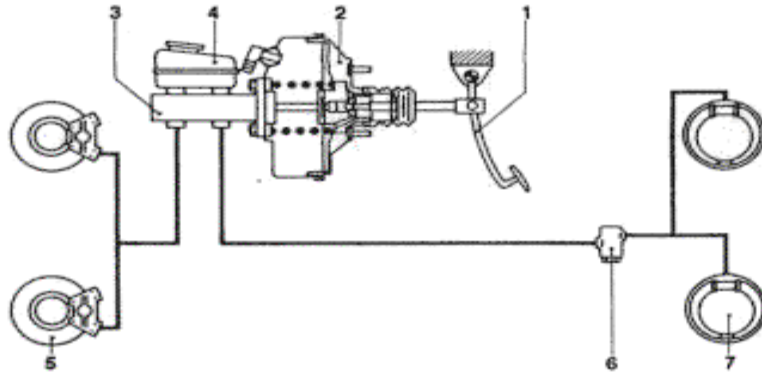
The mechanical advantage of the illustrated hydraulic lift here would be ...

- A. 1.1
B. 6.0
C. 2.5
D. 11
2. A 'hovercraft' is a ...
A. hydraulic device
B. pneumatic device
C. pneumonic device
D. hydroelectric device
3. A jackhammer is a pneumatic device that is used to break up the cement or concrete. The ear-splitting sound you are hearing is produced by ...
A. anvil
B. piston
C. the 'chuck'
D. compressed air
4. A sandblaster is used to improve the look of a building. The high pressure air lasts tiny sand particles to remove the dirt and paint from stone or brick. It is also used on smooth granite and marble stairs to make them...
A. less shiny
B. safer by increasing friction
C. look new
D. look older than they actually are (antiques)
5. The 'Jaws of Life', used by firemen to rescue injured people from a crushed car, use three types of tools - including all of the following, **EXCEPT** ...
A. contractors
B. spreaders
C. rams
D. cutters

Mechanical Systems

Topic 6 - Combining Systems Practice Quiz

1. Use the illustration, of a hydraulic disc brake system, below to answer the question.



The effort force required to slow the vehicle in this disc brake hydraulic system would be applied at number ...

- A. 1
 - B. 3
 - C. 5
 - D. 7
2. During the research phase, when a device is improved upon, certain criteria are taken into account. Of the criteria listed below, which would be the least important ...
- A. safety
 - B. efficiency
 - C. effectiveness
 - D. convenience
3. The 'backhoe' is a highly efficient combination of 3 different types of levers and this ...
- A. wheel and axle
 - B. pulley
 - C. hydraulics
 - D. pneumatics
4. When we can identify a simple machine, within a much more complicated machine, the simple machine is called a ...
- A. segment
 - B. subsystem
 - C. function
 - D. prototype
5. The 'boom' raises and lowers the 'dipper'. It is a ...
- A. Class 1 lever
 - B. Class 2 lever
 - C. Class 3 lever
 - D. Class 4 lever

Mechanical Systems

Topic 7 - Machines Through History Practice Quiz

1. In early times, people with buckets usually transported water from one place to another. A scientist later invented a device to make it easier, which used the motion of a simple machine. The device was called ...

 - A. Achilles water wheel**
 - B. Achilles pulley**
 - C. Archimedes wedge**
 - D. Archimedes screw**

2. An important milestone invention in the eighteenth century led to many changes in transportation technology. It was the invention of the ...

 - A. steam engine**
 - B. internal combustion engine**
 - C. hydraulic lift**
 - D. water wheel**

3. 'Paddle Wheelers' were common sites at one time on many rivers in North America. The machinery that moves the wheel, which propels the boat forward is powered by ...

 - A. gasoline**
 - B. air**
 - C. water**
 - D. steam**

4. Nowadays, a rotary engine is used to propel an ocean liner. The main difference between a rotary engine and a steam engine is that in a rotary engine the steam doesn't propel the piston, but turns the ...

 - A. rudder**
 - B. turbine**
 - C. housing**
 - D. cylinder**

5. The internal combustion engine was developed in 1876. The engine works because of the 'combustion that takes place inside the engine. The combustion is fueled by ...

 - A. gasoline**
 - B. water**
 - C. electricity**
 - D. air**

Mechanical Systems

Topic 8 - People and Machines Practice Quiz

1. Science and technology have given us many improvements in transportation. One of the most notable was the development of the 'horseless carriage', which was ...
 - A. scooter
 - B. segway
 - C. automobile
 - D. train

2. The Industrial Revolution enabled people to build many machines in a short period of time. This meant that more people could get these machines. The manufacturing process that made this possible was called ...
 - A. mass hysteria
 - B. mass production
 - C. industrial efficiency
 - D. international exports

3. Automobiles have continued to improve over the years. The improvements in fuel-efficiency and better gas mileage have come as a result of the invention and wide spread use of ...
 - A. bigger engines and aerodynamics
 - B. hydrogen and water power
 - C. fuel-injection and catalytic converters
 - D. urban renewal and urban sprawl

4. Machines have changed over time because of the purpose for which it is being used. Scientists ask themselves some difficult questions, including ...
 - A. How much is it going to cost?
 - B. Why should it be changed?
 - C. How difficult is it going to be to improve it?
 - D. What are the pros and cons?

5. When scientists discover a way to improve a device's comfort or efficiency they are tested. This testing provides additional scientific information to the designers. The research activity which analyzes improvements in comfort is referred to as 'the science of ...'
 - A. modification
 - B. pneumatics
 - C. ergonomics
 - D. hydraulics